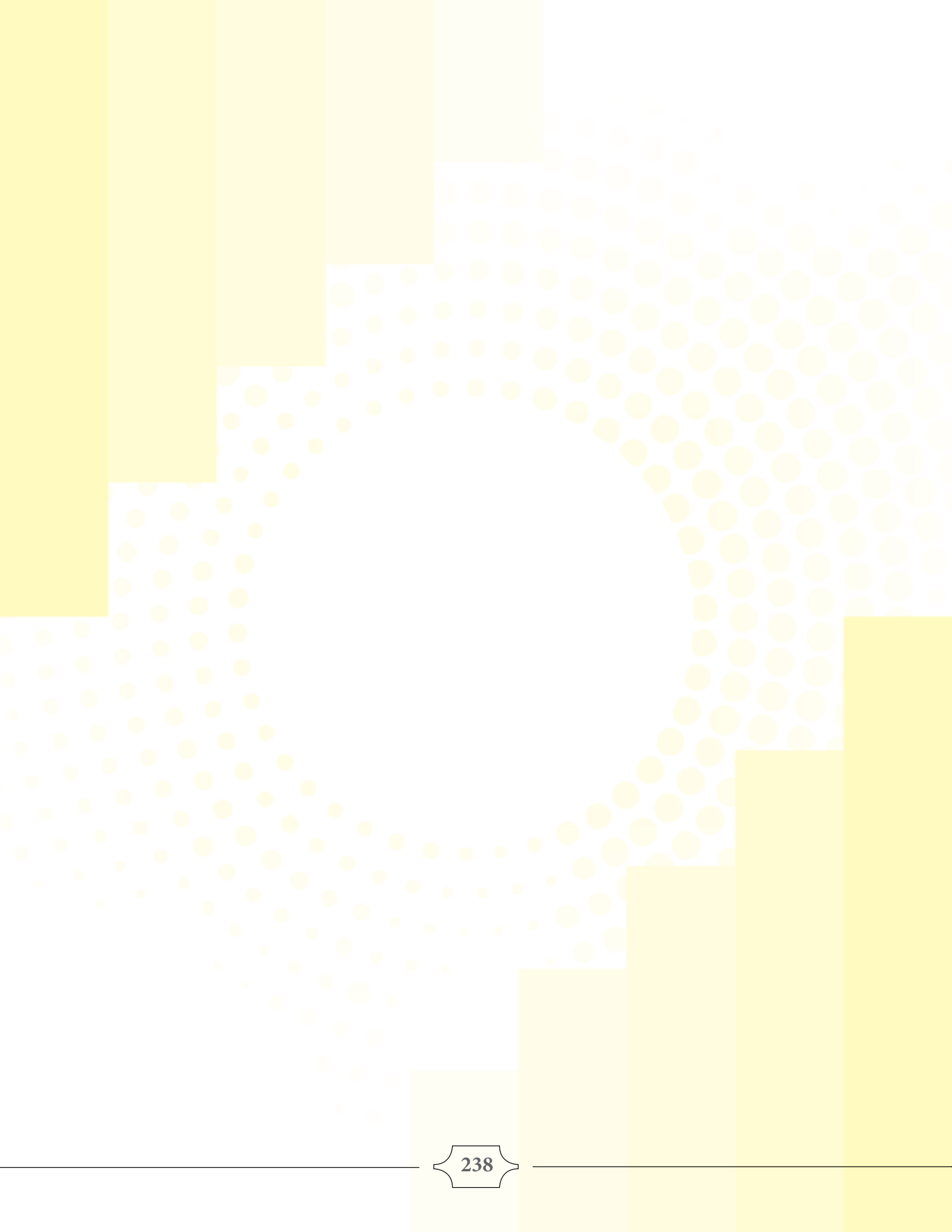# Science and Technology

Chapter – 14

Science and Technology

"New India is moving forward with Jai Jawan, Jai Kisan, Jai Vigyan as well as Jai Anusandhan."

- Hon'ble Prime Minister Narendra Modi

Science, Technology and Innovation are key drivers of economic performance. As the state emerges as one of the fast-growing economies, it needs to gradually move from being a net consumer of knowledge to becoming a net producer. The emergence of varied technologies has led the state to continue its transformation with the adoption of technology-led innovations to solve the societal challenges in the critical areas of education, agriculture, healthcare, smart mobility, affordable energy and rural development etc. At the same time, initiatives like "Make in India" and "Atma Nirbhar Madhya Pradesh" emphasize the use of technology for economic development. In addition, modern cutting-edge technology has the potential to improve government efficiency and accountability. Technology offers a multi-faceted idea that offers corruption control, efficient delivery of public services and timely response of the authorities. Digitisation of records, online applications and processing, e-district portal etc. are a few examples where the state have begun harnessing technology for good governance.

The Department of Science and Technology at Madhya Pradesh was established in June 1981 with a vision to improvise the government services to the citizens of Madhya Pradesh by empowering the various State Level Department with the latest technology service ensuring robust infrastructure and sustainable livelihood through the application of Science and Technology. Under the Department of Science & Technology, GoMP, two organizations, namely Madhya Pradesh State Electronics Development Corporation Ltd. (MPDESC) and Madhya Pradesh Council of Science & Technology (MPCST) are functioning.

Madhya Pradesh State Electronics Development Corporation (MPSEDC) is promoting, establishing, and developing Information Technology (IT) /Information Technology Enabled Services (ITeS) and Electronics (EHM/ESDM) industries, as per the policies in the state. Presently, MPSEDC has been entrusted with the responsibility as a nodal agency for the implementation of various prestigious IT projects of GoI and GoMP in Madhya Pradesh, viz. Development of IT PARKS, EMCs, Infrastructure Development for SWAN, SDC, PARICHAI, e-Office, Aadhaar, etc., which are in progress. Alongside, it provides IT inputs which includes technical assistance in computerization, networking, and IT consultancy services to the Departments/Government agencies. The organization is working through the cooperation of State e-Mission Team (SEMT), Project e-Mission Team (PEMT), Center of Excellence (CoE), District e-Governance Society (DeGS), Project Monitoring Unit (PMU), Training and Collaboration Unit (TCU), Geographical Information System (GIS) etc.

Madhya Pradesh Council of Science and Technology (MPCST) was registered in October 1981 under the Madhya Pradesh Registration of Societies Act, 1973 with the prime objective to cater the needs of Scientific & Technological requirements of the State and to advise Government on policies

and measures necessary to promote utilization of Science & Technology for achieving the socio-economic objectives of the state.

14.1 Policy Framework

A sound policy framework is required to create and sustain a conducive Science and Technology infrastructure in the state. This infrastructure is necessary to ensure the seamless delivery of citizen services and to support various development programs and schemes in the state. Department of Science and Technology, Government of Madhya Pradesh has taken a sequential policy approach to augment critical Science-Tech building blocks in the state. In 2022 they initiated the process of integrating these building blocks to architect a Science-Tech ecosystem that will enable innovation and attract investment in tech space.

14.1.1 Madhya Pradesh Science, Technology and Innovation Policy 2022

Madhya Pradesh Science, Technology and Innovation Policy 2022 has been launched by the Department of Science and Technology, Government of Madhya Pradesh. This is the first policy of Madhya Pradesh which envisions building scientific temper in society, strengthening the innovation ecosystem, fostering Science and Technology (S&T) enabled entrepreneurship and citizen services, preserving traditional knowledge systems, and encouraging inclusion and participation of the grassroots levels in the research and innovation ecosystem. This policy focuses on following primary areas-

- Promotion of Research and Development.
- Popularization of science and promotion of scientific temper.
- Adoption of emerging technologies like IoT, AI, machine learning, natural language processing, block chain, drone technology, biotechnology etc.
- Harnessing data.
- Strengthening ecosystem for innovation.
- Skilling and capacity building.
- Collaboration with International and National institutions of excellence.

A Directorate will be established as an institutional mechanism and a strategic team will be promptly assigned to the department to assist in implementation of this policy.(Source: Department of Science & Technology, GoMP)

14.1.2 Other Policies

To leverage the STI (Science, Technology and Innovation) ecosystem in Madhya Pradesh, a pool of different policies like Madhya Pradesh Data Sharing and Accessibility Policy 2014, Madhya Pradesh State Spatial Data Infrastructure Policy, 2014, Email Policy of Madhya Pradesh Government 2014 has been launched. Tower Policy 2019 has been launched by GoMP and is in an amendment state which includes RoW rules issued by the Department of Telecommunication, Government of India, in August 2022. To attract IT/ITeS investment in the state, IT, ITeS and ESDM Investment Promotion Policy and Scheme 2016 is in place. Department of Science & Technology also unveiled its Cloud Adoption Framework in October 2022 with the objective of providing guidance to Government/semi-

government organizations to understand and follow a standard process while planning to host its identified software applications on the cloud. (Source: Department of Science & Technology, GoMP)

14.2 Budget Allocation to Science and Technology Department in Madhya Pradesh

In the financial year 2022-23, the budget allocated to the Department of Science and Technology is an amount of Rs. 341.12 crore from the state budget of Rs. 2,47,715.44 crore. Over the past two decades, there has been a significant increase in budget allocation for the S&T department, with trends indicating a nearly 95 times increase along with the state budget that has also demonstrated a positive pace of growth over this period of time. Major budget utilization of the Science and Technology department is in the areas of research planning and development activities, State Data Center operation, upgradation and maintenance, State Wide Area Network (SWAN) establishment, the establishment of IT parks, grants for operating Regional Capacity Building Centres (RCBC), District eGovernance Societies (DeGS), and NIC centres etc.
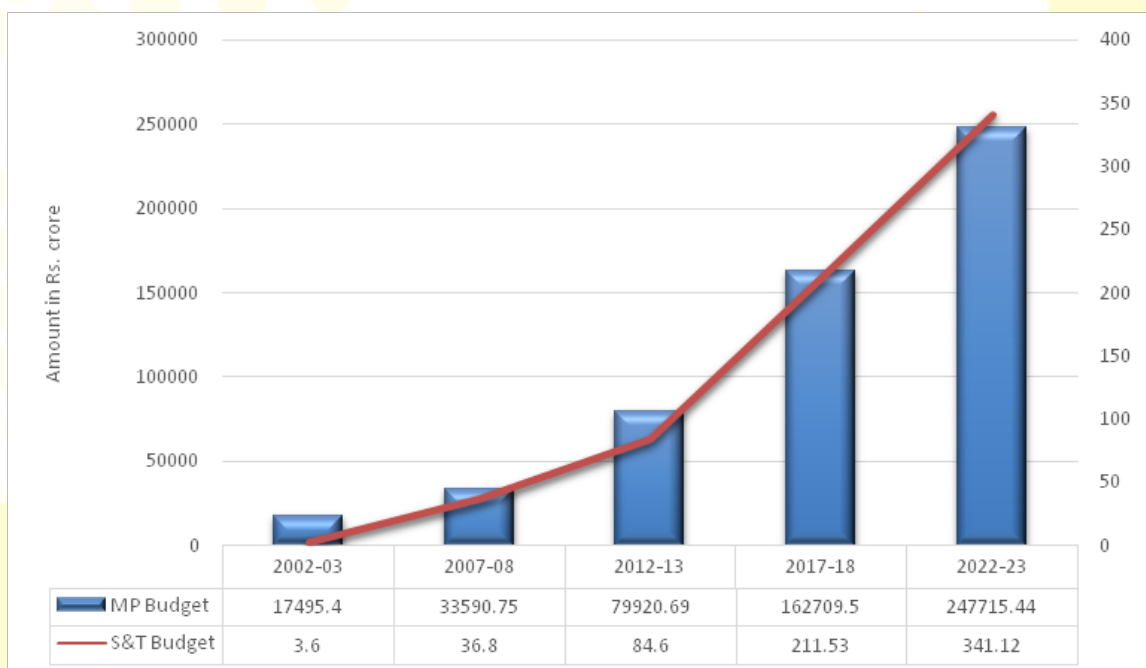

	2002-03	2007-08	2012-13	2017-18	2022-23
MP Budget	17495.4	33590.75	79920.69	162709.5	247715.44
S&T Budget	3.6	36.8	84.6	211.53	341.12

Figure 14.1 : Trends of Budget Allocation to S & T Department

Source: Department of Finance, GoMP

Note:

(i) The budget of F.Y. 2002-03, 2007-08 and 2012-13 includes the combined figure of the Department of Science & Technology and Department of Information Technology.

(ii)On dated 28.07.2014, the Department of Information Technology merged with the Department of Science & Technology

(iii) Amount of the Financial year 2002-03, 2007-08, 2012-13 and 2017-18 are actual(A) figures as per budget books.

14.3 Research, Innovation and Entrepreneurship ecosystem in Madhya Pradesh

14.3.1 Contribution of Central Research Institutions in R&D

To strengthen the STI ecosystem, there are 29 Central Government Institutes in the state, which includes- CSIR-Advanced Materials and Processes Research Institute (AMPRI), Bhopal, Indian Institute of Science Education and Research (IISER), Bhopal and All India Institute of Medical Science (AIIMS), Bhopal etc. Contributing to research and development, CSIR-AMPRI, Bhopal has developed know-how of making "Bamboo Composites for Modern Housing and Structures" where Indian Patent has been filed on Bamboo composite. IISER, Bhopal has also made significant contributions to research and development with 24 patents granted in collaboration with other institutes during the last 10 years in various fields, including Biological Sciences, Electrical Engineering and Computer Science etc. Similarly, IIT Indore is having 23 patents granted during the last 10 years in various fields, which include Computer Science Engineering, Biosciences and Biomedical Engineering etc. (Source: Advanced Materials and Processes Research Institute (AMPRI), 2020, Compendium on State level Ecosystem, DST, GoI, 2022, IISER website as accessed on 19.02.2023, IIT, Indore website as accessed on 19.02.2023)

ICAR - National Institute of High Security Animal Diseases, Bhopal carries out basic and strategic research on exotic, emerging and re-emerging animal diseases along with the creation and updating of a repository and data bank on exotic/emerging pathogens (Source: National Institute of High Security Animal Diseases, Bhopal). ICMR-National Institute of Research in Tribal Health (NIRTH), Jabalpur, undertakes research on tribal population health issues like nutritional disorders, common communicable and non-communicable diseases, environmental health challenges, and so on. (Source: National Institute of Research in Tribal Health, Jabalpur)

14.3.2 Atal Tinkering Labs in Madhya Pradesh

Atal Tinkering Laboratories (ATLs) are being established in schools all around India as part of the Atal Innovation Mission to "Cultivate One Million Children in India as Neoteric Innovators." The scheme aims to cultivate in young brains traits like curiosity, inventiveness, and creativity, as well as abilities like design mentality, computational thinking, adaptive learning, and physical computing. Out of a total of 10,000 ATLs established in India, Madhya Pradesh has 601 ATLs established till July 2022 and out of 601 ATLs in the state, 145 ATLs are located in the tribal districts of Madhya Pradesh. (Source: Atal Innovation Mission, NITI Aayog, GoI, 2022 as accessed on 05.02.2023).
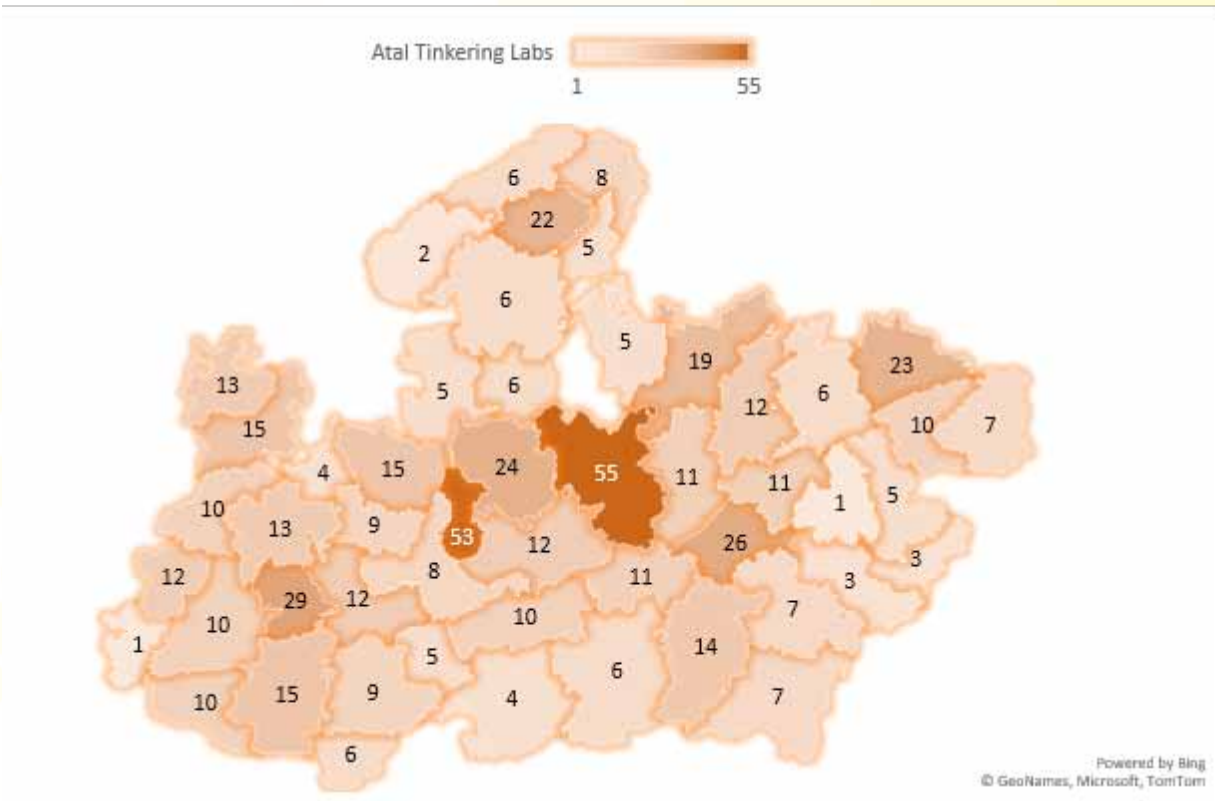
Figure 14.2 : Number of Atal Tinkering Labs established in Madhya Pradesh

Source: Atal Innovation Mission, NITI Aayog, Government of India

14.3.3 Incubation Centres in Madhya Pradesh

Incubation centres are organisations which offer essential support for the growth and development of startups and are an imperative part of the startup ecosystem as an early stage mentors with the aim to improve the survival and growth of new startups substantially, create employment opportunities, develop entrepreneurial environment, commercialize new technologies, create and retain businesses, build or accelerate growth in local industry and diversify economies. In Madhya Pradesh, the total number of incubators is 32 as on January 2023, which is providing support for entrepreneurs in cities of Madhya Pradesh.

Out of the 32 Incubation centres, three Incubation centres namely AIC Aartech Solonics Pvt Ltd, AIC RNTU Foundation and AIC Prestige Inspire Foundation, are part of Atal Incubation Centers (AICs). (Source: Atal Innovation Mission, NITI Aayog, GoI, 2022, Department of MSME, GoMP website as accessed on 06.02.2023).

14.3.4 Startups in Madhya Pradesh

In Madhya Pradesh, the number of startups have gradually increased from previous years. The number of startups in the state increased from 289 in 2018 to more than 409 in 2022. (Source: Press Information Bureau, as accessed on 06.02.2023).

Table 14.1 : Trend of Startups (last 5 years) in Madhya Pradesh

(values are in numbers)

Year	2018	2019	2020	2021	2022
Madhya Pradesh	289	329	425	558	409*

Source : Ministry of Commerce and Industry, Department for Promotion of Industry And Internal Trade, GoI https://www.startupindia.gov.in/content/sih/en/state-startup-policies.html as accessed on 06.02.2023. and Press Information Bureau, https://pib.gov.in/PressReleasePage.aspx?PRID=1843897 as accessed on 06.02.2023.

Note: Data available in the source is updated as on 30th June 2022. So the total figure is likely to be more by the end of the year. Presently total DPIIT reconized startups in Madhya Pradesh are 2,743 in numbers.

14.3.5 Intellectual Property Rights (IPRs) in Madhya Pradesh

Madhya Pradesh improved significantly in patent and design filing. In India, the number of patents filed and granted has gradually increased. The number of patents filed in India increased by 22.25% from 47,854 in 2017-18 to 58,503 in 2020-21, compared to 190 in MP in 2017-18 to 398 in 2020-21, an increase of 109.47%. This data reveals that MP improved its patent filing rate, which is now 87.22% higher than the national average. The number of designs filed in India increased by 20.29% from 11,838 in 2017-18 to 14,241 in 2020-21, compared to 61 in MP in 2017-18 to 214 in 2020-21, an increase of 250.82%.

This data shows that MP significantly improved in design filing, and it is higher by 230.59% than the national average. According to national statistics, the patenting and design filings scale is fairly modest, but Madhya Pradesh's catalytic strategy has substantially improved. MP (in the last 5 years) has bagged three GI tags: Balaghat's Chinnor Rice, Jhabua's Kadaknath Black Chicken Meat, and Mahoba's Desawari Pan, shared with UP.

Table 14.2 : Number of IPRs filed in Madhya Pradesh

(values are in numbers)

S. No.	Financial Year	Patent Filed		Design Filed	
		India	MP	India	MP
1	2017-18	47,854	190	11,838	61
2	2018-19	50,659	194	8,864	62
3	2019-20	56,267	285	9,706	127
4	2020-21	58,503	398	14,241	214

Source: MPCST, based on data from Indian Patent Office, GoI

Figure 14.3 : Trend of Patent Filed

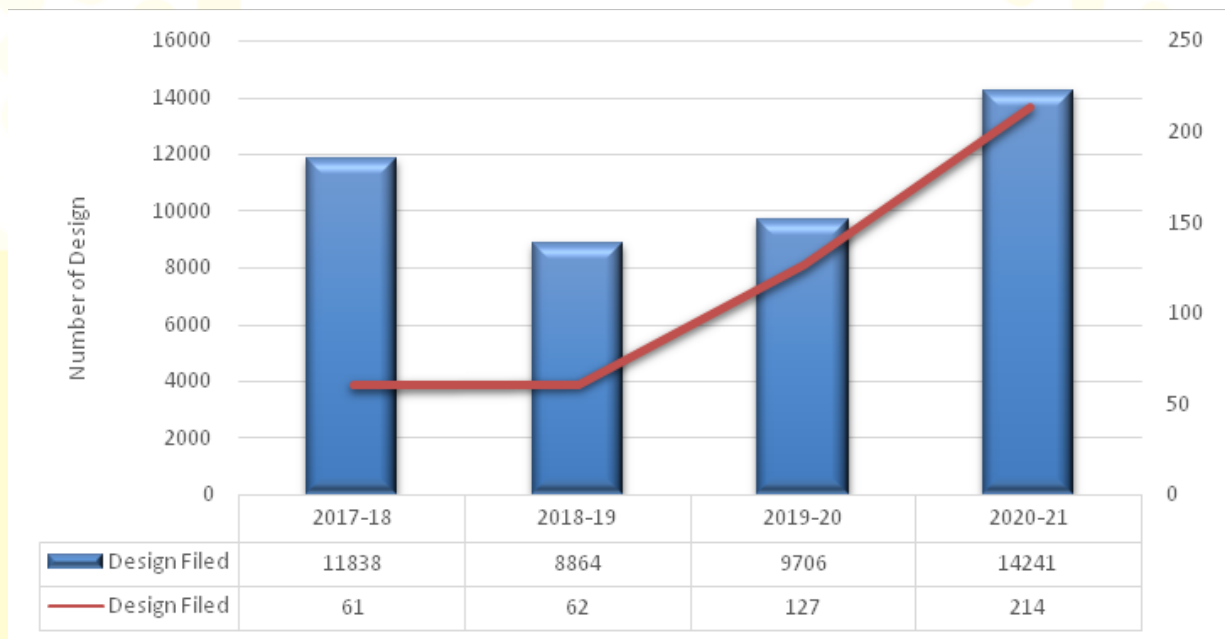*Source: MPCST, based on data from Indian Patent Office, GoI*

	2017-18	2018-19	2019-20	2020-21
Patent Filed	47854	50659	56267	58503
Patent Filed	190	194	285	398

Figure 14.4 : Trend of Design Filed

Source: MPCST, based on data from Indian Patent Office, GoI

	2017-18	2018-19	2019-20	2020-21
Design Filed	11838	8864	9706	14241
Design Filed	61	62	127	214

14.3.6 Human Capital

The total student enrolment in PhD and post-graduation courses in Madhya Pradesh is given in the table below. Data trends in the last 5 years indicate that student enrolment in the PhD has increased by 88.05% and 81.26% in post-graduation courses in Madhya Pradesh. In the previous five years, overall female student's enrolment in courses was higher as compared with male student's, i.e., 92.91% of female and 84.91 % of male students increased in the last 5 years in PhD and 83.75% of female and 78.46% of male students enrolment increased in post-graduation courses. Madhya Pradesh is now emerging as a potential producer of research-oriented students in various sectors.

Table 14.3 : Number of PhD and Post Graduate students enrolled

(values are in numbers)

Year	PhD			Post Graduate		
	Male	Female	Total	Male	Female	Total
2016-17	1,988	1,284	3,272	89,227	1,00,343	1,89,570
2017-18	2,427	1,558	3,985	95,923	1,10,113	2,06,036
2018-19	2,383	1,710	4,093	1,00,896	1,21,265	2,22,161
2019-20	3,006	2,441	5,447	125,638	1,59,465	2,85,103
2020-21	3,676	2,477	6,153	1,59,236	1,84,377	3,43,613

Source: All India Survey on Higher Education Report (2016-2021)

14.4 Efforts for Science Popularisation

14.4.1 India International Science Festival (IISF)

For the first time, the Government of Madhya Pradesh hosted the 8th India International Science Festival (IISF) from January 21st-24th, 2023, in which the nodal organisation was the Madhya Pradesh Council of Science and Technology. Marching towards Amrit Kaal with Science, Technology, and Innovation was the theme of this four-day festival with the purpose of creating awareness and dissemination of science among common people joyfully and entertainingly which is essential for a healthy, prosperous and meaningful life.

More than 2,500 school students across India participated in the festival. Additionally, the festival featured Biotech and Agri-tech startups. Also, smart and knowledgeable toys made by local artisans at IISF were displayed.

14.4.2 12th Science Film Festival Bhopal

To celebrate the science outreach through cinema Government of Madhya Pradesh hosted the 12th Science Film Festival from August 22nd - 26th, 2022, where nodal organisations were Vigyan Prasar and Madhya Pradesh Council of Science and Technology (MPCST). While science films were shown, professionals in master workshops and panel discussions addressed the ways to improve the medium of science communication.

14.5 Special and New initiatives

Department of Science and Technology, Government of Madhya Pradesh, is striving hard towards building a conducive ecosystem in the state with a pool of state initiatives and centrally sponsored schemes.

14.5.1 STI for Good Governance

Center of Excellence

Madhya Pradesh State Electronic Development Corporation is committed to developing its competencies in the field of Information and Technology and e-Governance and to developing innovation and world-class IT solutions in the state. Center of Excellence Software Development Unit and Madhya Pradesh State Spatial Data Infrastructure (MPSSDI) are working under the corporation, which has developed more than 400 websites/portals / mobile applications etc., so far.

e-Girdawari

Madhya Pradesh is the first state to implement the crop "e-Girdawari" project developed by MPSSDI that aims to better implement and streamline the process of Girdawari operations through Artificial Intelligence/Machine Learning (AI/ML). In this initiative, the crop e-Girdawari model has been developed by integrating satellite and other new technologies on AI/ML platform. In the Fasal Girdawari project, models have been trained on a machine-learning platform to predict crop types using satellite information and crop survey records. Farmers can register their crops themselves through the MP Kisan app, and after that, the patwari prepares the final Girdawari report based on the mismatched crop (machine learning and farmer information). In the crop girdawari process, optical satellite data has been used for the rabi season while radar (SAR) data has been used for Kharif season due to cloud presence. The Machine Learning (ML) model is designed to predict wheat, gram, mustard, cotton and pea for the rabi season and paddy and soybean for the Kharif season. This model is being adopted by the Revenue Department for Girdawari in Rabi and Kharif crop seasons from 2021.
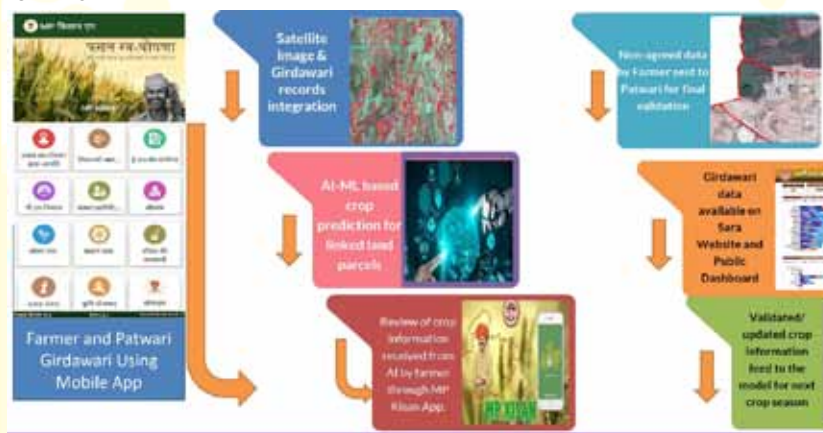

Figure 14.5 : Process Flow of e-Girdawari Project

Source: Madhya Pradesh State Electronics Development Corporation

Disaster Warning Response System

The Disaster Warning Response System (DWRS) portal has a three-tier architecture, namely the District Command and Control Center (DCCC) at the district level, the State Command and Control Center (SCCC) at the state level, and the Vallabh Bhavan Situation Room (VBSR) at the Ministry, which is based on GIS technology, and is equipped with the facility of web-application, mobile-application and various digital feeds and dashboards, so that the concerned officials can see the affected areas, helps in sending and receiving alerts. In addition, DCCC, located at all 52 district headquarters, has been integrated with SDERF headquarters, and VBSR, located at the Secretariat, has also been integrated through DWRS. The system visualizes river basins, drainage, roads, railway lines, settlements, and infrastructure in the Narmada basin of the Madhya Pradesh region. It facilitates forecasting villages/habitations to be inundated due to floods in reservoir catchment areas. It also provides the facility to update ground data for the officials, so that the actual ground details can be seen and work plans can be analyzed accordingly.
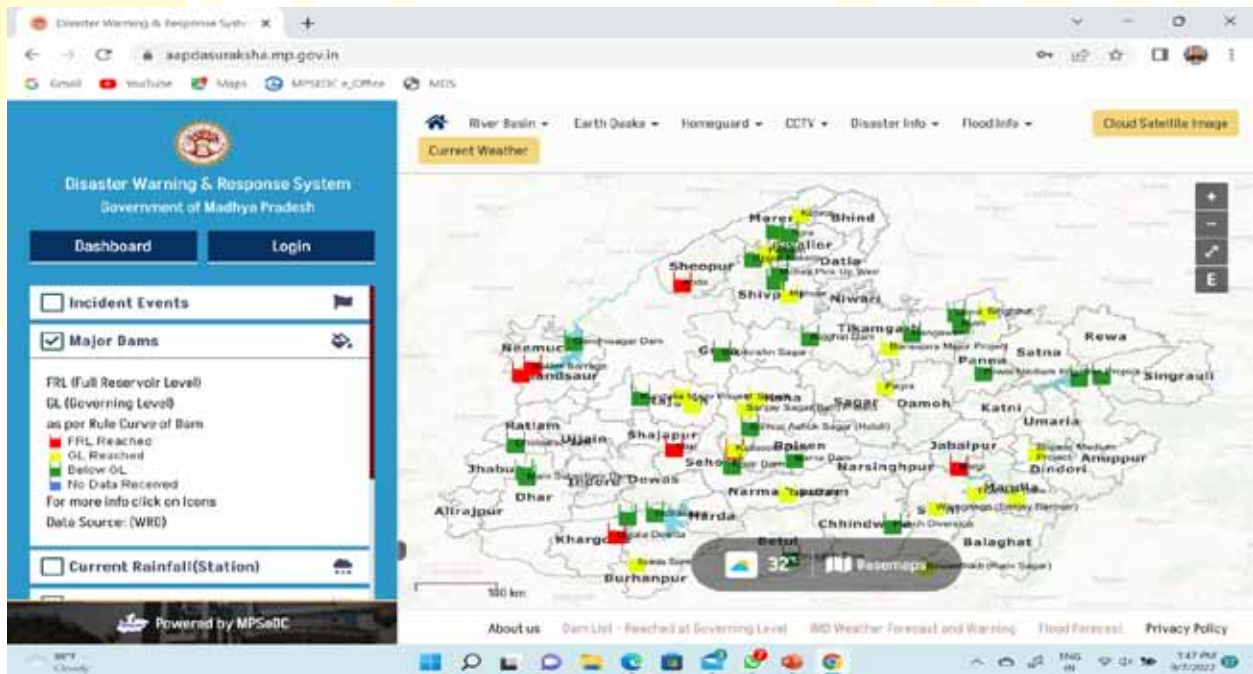

Figure 14.6 : Screenshot of Disaster Warning Response System

Source: Madhya Pradesh State Electronics Development Corporation

Drones

Drone technology is being used smoothly in the field of e-governance by MPSSDI. On April 18, 2022, as per the order of the Government of Madhya Pradesh, MPSEDC was declared as the nodal agency for the implementation of drone technology in the state. With a view to identifying the applications and users of drones, MPSEDC has conducted more than 30 different projects in more than 15 sectors and laid down standards and protocols for the use of drones and shared them with the concerned departments. In order to promote the use of drones at the district level, a provision has been made to use an amount of up to Rs. 10 lakh per year for innovation in drone technology in each district.
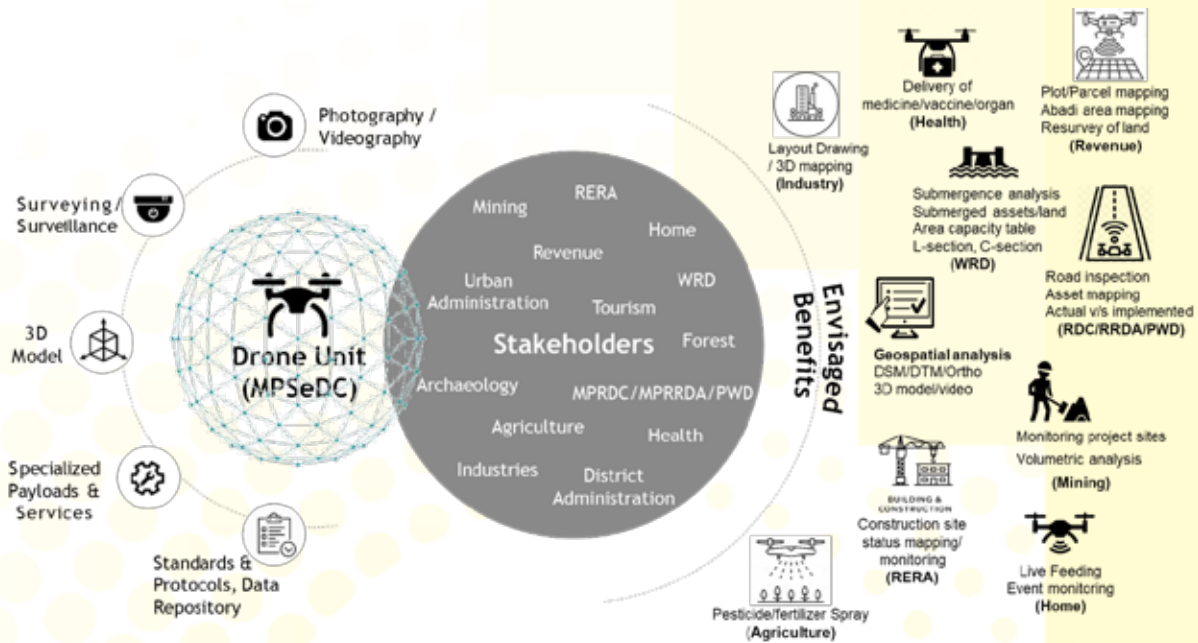
Figure 14.7 : Drone Users & Applications

Source: Madhya Pradesh State Electronics Development Corporation

Cyber Tehsil

For the first time in the country, "Cyber Tehsil" has been arranged by Madhya Pradesh under the Revenue Case Management System, making the mutation process quick and easy. In this, the facility of cropless and contactless mutation of land has been provided to the citizens of the state.

M.P. Parichai

M.P. Parichai (formerly known as M.P. SRDH) – UIDAI is a comprehensive application using biometric information to facilitate "Unique ID" based identity authentication. Through MP Parichai, the facility of Aadhaar authentication is given to various government departments.

Single Citizen Database

Single citizen database, also known as 'Samagra', is a social security program conceptualised by the Government of Madhya Pradesh to improve the Government-to-Citizen (G2C) interaction. Various schemes related to the people living below the poverty line, old age, daughters, widows, desolate and disabled are facilitated through Samagra. This database has the registration of 20.6 million families having 81 million members.

GATISHAKTI Sanchaar Portal

Center of Excellence has created the "Gatishakti Sanchar Portal", which is a collaborative institutional mechanism between all the stakeholders, including the Central and State/UT Government, to facilitate the Right of Way (ROW) application process through a single interface which makes the process easier.

e-tendering

Electronic tendering is a very reliable technique in the process of publication, sale and opening of tender documents for various works related to infrastructure departments. National Informatics Center (NIC) has been selected for the e-tendering project, and NIC's portal (GEPNIC) is being used for the e-tendering system. The total tenders published on the portal (from Nov 2018 to Jan 2023) are 2,73,495, whose value is Rs. 5,77,553 crore, of which 1,19,073 tenders are awarded. The benefits of this system include transparency and speed in the tendering process.

Automation of fair-price shops located in the state

With technical assistance from the MPSEDC, the Department of Food, Civil Supplies, and Consumer Protection, GoMP, is automating the Fair Price Shops that are present throughout the state. The technical assistance includes Point of Sale (PoS) hardware, application development and customisation, upkeep of PoS hardware, training, helpdesk assistance, project management unit, divisional level technical support, and management information system, etc. As per MPSEDC, there are 26,457 fair-price shops in Madhya Pradesh presently.

Aadhaar Enrolment

Madhya Pradesh State Electronics Development Corporation is appointed as the nodal agency for the Aadhar enrolment of citizens in the state. By December 2022, the Aadhaar registration of 99% of the estimated population has been done.(Source: Madhya Pradesh State Electronics Development Corporation, 2023).

State-level agency (SLA) for Elections

Madhya Pradesh State Electronics Development Corporation Ltd. (MPSEDC) has been working as a state-level organization SLA for the office of the Chief Electoral Officer, Bhopal, since 2002 and for the State Election Commission, Bhopal, since the year 2015. By the year 2025, the corporation has been appointed as a state-level agency (SLA) by the Chief Electoral Officer's Office and the State Election Commission. According to the agency's statistics, a total of 3.10 crore PVC EPICs (Voter ID Cards) were printed from June 2013 till February 2023.

M.P. Code Portal

This portal is developed by MPSEDC. In this portal, State legislations, rules made under them, State rules made independently, some important Central legal provisions, and State amendments made therein are included. It is available in an updated form. It is expected to be useful not only for those in the legal field, i.e. Judges, Lawyers, Litigants, Law-students and Research scholars, but shall also save time in reference work for legislatures, representatives of the people and the common man.

Table 14.4 : Current status of the MP Code portal

(values are in numbers)

S.No.	Name	Total Records (Hindi)	Total Records (English)	Grand Total
1	Acts	497	645	1,142
2	Rules	761	740	1,501
3	Regulation	48	58	106
4	Notification	147	316	463
5	Repealed Act	6	11	17
6	Circular	32	358	390
7	Order	51	234	285
	Grand Total	1,542	2,362	3,904

Source: Madhya Pradesh State Electronics Development Corporation Ltd.

Computer Proficiency Certification Test (CPCT)

To assess the computer efficiency and typing skills of the candidates for government posts, the government has made Computer Proficiency Certification Test mandatory in the state for which MPSEDC is the nodal agency. The proficiency of the candidates has been accessed through an Computer Based Online Examination consisting of Multiple-Choice Questions and Typing Test (Hindi and English Typing). For Operator/Assistant Grade-3/Stenographer/Steno Typist/ Data Entry / IT Operator and similar posts of various departments of GoMP where computer proficiency and typing skill is the primary qualification, passing of Computer Proficiency Certification Test (CPCT) is an essential qualification. As per MPSEDC, the total number of candidates who appeared in CPCT is 5,00,000, of which 2,36,600 are certified in the CPCT.

For effective and efficient delivery of citizen services, other e-governance initiatives like the CM dashboard, Atmanirbhar Madhya Pradesh portal and MP e-district portal are in place and for the details of the aforesaid initiatives, Chapter - "Good Governance" can be referred.

14.5.2 Digital infrastructure

Madhya Pradesh State Spatial Data Infrastructure (MPSSDI)

Madhya Pradesh State Spatial Data Infrastructure (MPSSDI) has been established at MPSEDC for the sustainable use of GIS technology in the state. Its primary objective is to create a single spatial data repository of standardized GIS data, geo-rectification of remote sensing data as per the state framework, create of data repository, and provide GIS technology-based services to various government departments. In this infrastructure, more than 150 GIS data layers and a data repository of more than 3.5 lakh points of interest have been prepared, which is updated regularly. Along with this, GIS-based web spatial decision support systems are also being created for various departments of the state.

State Wide Area Network (SWAN)

MPSWAN is being implemented to provide internet connectivity to all 52 District and 349 Block/Tehsil, along with all government offices/institutions. The network will help the respective department of Govt. of MP to use MPSWAN as a common infrastructure for integrating their offices, thus helping in effective means of communication. This will improve the means of communication in the state administration and also bring Govt. closer to the public, which will certainly help in effective administration and reduction in cost. Presently, the entire SWAN network is managed by the MPSEDC team, and Network Specialist Team is also involved in end-level support (Madhya Pradesh State Electronics Development Corporation, 2023). Under this project, 401 Point of Presence (PoP) sites has been developed in Madhya Pradesh. As per the evaluation and analysis of MPSWAN requirements, the network equipment has been upgraded with SD-WAN (Software Defined Wide Area Network), which can efficiently and effectively meet the MPSWAN requirements by replacing similar network equipment. SD-SWAN is largely independent of the available data transport mechanisms and provides higher security standards. SWAN network has been declared a protected system under Critical Information Infrastructure (CII) by the state government.

IT Parks

In four of the state's largest cities (Bhopal, Indore, Gwalior and Jabalpur), IT parks have been developed on land allotted by the government for the development of information technology and to attract investment in the sector. Approximately 400 acres of land have been allotted (204 acres in Bhopal, 20.76 acres in Gwalior, 63 acres in Jabalpur and 112 acres in Indore), out of which 90 acres (50 acres in Bhopal and 40 acres in Jabalpur) have been set aside for electronics manufacturing cluster. (Department of Science & Technology, 2022) The total investment done in these IT Parks in the last 5 years is Rs.161.49 crore. Industries set up in these IT Parks employed 14,473 personnel in the last 5 years. A total of 270 plot units has been acquired for IT/ITes investment out of 220 units in all IT parks (Madhya Pradesh State Electronics Development Corporation, 2023).

Electronics Manufacturing Clusters in the state

Under the project of electronics manufacturing clusters in the state (by the Government of India), which is proposed in Bhopal and Jabalpur in the state, 50 per cent share of the Government of India, 25 per cent share of State Government and 25 per cent share of industrial units has been provided. A special Purpose Vehicle (SPV) has been constituted for the operation of the project.

State Data Center

A state-level State Data Center has been established in Bhopal under the National e-Governance Plan with the collaboration of the Department of Science and Technology, the Government of India, and the Government of Madhya Pradesh. The institution responsible for carrying out this programme is called the Madhya Pradesh State Electronics Development Corporation Limited (MPSEDC). Presently, only the State Government is responsible for managing, upgradation, operation & maintenance of the state's Data Center.

Percentage of Gram Panchayats with Internet Connection

BharatNet is a telecom infrastructure provision set up by the government of India to establish, manage and operate the National Optical Fiber Network that aims to provide a minimum of 100 megabits per second of broadband connectivity to all gram panchayats in the country. In

Madhya Pradesh, till April – November 2022, 78.51%-gram panchayats are connected with optical fiber internet connection (Bharat Broadband Network Limited, 2023). The government of India provided a grant of Rs.185 crore to BSNL for the deployment of High-speed Broadband connection to Government institutes at the village level.

14.5.3 STI in Education

EDUSAT Hub

For the promotion of science through satellite technology, modern science and experimental science is disseminated to the students of different classes and section by making it interesting through the EduSat Hub established in the Madhya Pradesh Council of Science and Technology (MPCST). Various programs are aired from time to time for the promotion of science by the Department of Science and Technology, Government of India. Indian Institute of Remote Sensing, Dehradun ISRO's Geospatial Technology training courses were conducted on Council's EDUSAT network. Scientific programs broadcast from IIRS, Dehradun and Vigyan Prasar, New Delhi, were screened at the EDUSAT Hub established in the Council. EDUSAT Division of MPCST has been nominated to act as the nodal institute for conducting the IIRS Outreach Course in collaboration with the Indian Institute of Remote Sensing (IIRS), Dehradun. In this series, the Council's EDUSAT division continuously plays its active role in 2022 by organizing IIRS, ISRO's outreach course through the EDUSAT division in Bhopal. In the year 2021, nine state-of-the-art outreach courses on remote sensing, GIS, GPS and related high-tech subjects have been successfully organized, that includes-

i.   Artificial Intelligence (AI) for Earth Observation (EO) and Geodata Handling and Processing.
ii. Fundamentals of Remote Sensing and GIS Technology (in Hindi).
iii. Overview of Global Navigation Satellite System.
iv. Overview of Geographical Information System.
v.   Overview of Geo computation and Geo-web Services.
vi. Applications of Geospatial Technology in Paleochannel Studies: Potential and Future Trends.
vii. RS and GIS Applications in Natural Resource Management.
viii. UAV Remote Sensing.
ix. Advances in Monitoring and Modeling of Hydro-Meteorological Hazards using Geospatial Technology and Process-based Models.

ISRO Medical Education Network

Under Medical Education, the program broadcast from ISRO was coordinated for display in the functional telemedicine centers. Through the telemedicine network established by ISRO, 7 currently functioning telemedicine centers participated in the Continuing Medical Education organized by ISRO, Ahmedabad.

In the aforesaid programme, out of 16 telemedicine centers established in the state, 7 functional telemedicine centers, Gandhi Medical College, Bhopal; All India Institute of Medical

Sciences, Bhopal; Padhar Hospital, Betul; District Hospital, Shajapur; District Hospital, Sidhi and Gajraja Medical College, Gwalior participated.

14.5.4 STI for Rural Development

Preparation of development plan of selected watershed areas under the Integrated Watershed Management Program based on Remote Sensing and Geographical Information System

An action plan for the implementation of catchment area management programmes is created at the Khasra level under the River Rejuvenation Program of the Department of Panchayat and Rural Development, Government of Madhya Pradesh, using triennial satellite data of selected water catchment areas covering approximately 21.36 lakh hectares.

Subject-wise maps of 50 water catchment areas of Alirajpur district, 41 of Betul and 138 of Mandla were prepared and handed over to the concerned districts under the River Rejuvenation Project. Khasra, contour, drainage, ortho rectified satellite images and geomorphology maps of water catchment areas of Sidhi district were prepared and handed over under the land area improvement programme. GIS-based maps were prepared for Adarsh village in villages Baranga and Harda Khas of district Harda. Action plans were prepared using the drainage, contour and ortho rectified images of the Barwani district.

Space-Based Information Support for Decentralized Planning – Update (SISDP and Update)

ISRO started the SISDP project to provide fundamental planning inputs based on satellite data to Gram Panchayats at the local level for the execution and monitoring of development plans. The SISDP project Phase-I was successfully finished in the academic year 2016–17. SISDP and Update have been introduced based on the results of SISDP Phase-I. Geodatabase, products and services created under this project can be disseminated through Bhuvan Geo Portal. This database visualization and data analytics are provided for the benefit of Gram Panchayat members and other stakeholders.

Under the project, drainage, canal and water body were made on a 1:10000 scale in 15 districts, and the road and rail layer was made on a 1:10000 scale in 25 districts.

Table 14.5 : Status of work completed under SISDP and Update

S.No.	Total Panchayats of Madhya Pradesh		
1	Roads	Panchayat – 17,158	75.20% of work completed
2	Rails	Panchayat – 17,158	75.20% of work completed
3	Drainage	Panchayat – 16,654	73% of work completed
4	Water bodies	Panchayat – 16,654	73% of work completed
5	Canal	Panchayat – 16,654	73% of work completed

Source: Madhya Pradesh Council of Science and Technology

Integrated Watershed Program (IWMP) project monitoring work using geospatial technologies

Monitoring and evaluation of sanctioned IWMP projects for Madhya Pradesh have been carried out from the year 2009-10 to 2014-15 under the project "Monitoring of Integrated Watershed Program IWMP Project using Geospatial Technologies".

Under the WDF (Indo-German Water Shed Development Fund) of NABARD, the ground changes report of 16 micro sheds of 7 districts was prepared, and the work of updating was done.

Development of a framework for integration of climate information in planning and decision-making to enhance the impact of MGNREGA in the selected district of Madhya Pradesh

This framework is used to develop a web-accessible geo-portal for searching and accessing geographic information and associated geographic services through the internet. Panchayats of Newari block was surveyed, and the water budget of each panchayat was measured from the complete data obtained. A comprehensive survey and data collection of all gram panchayats of Thikri block of Barwani district is in progress. The work of extensive survey and data collection of Gram Panchayats of Garatganj and Raisen development block of Raisen district is in progress.

Forecasting Agriculture Output Using Space, Agro-meteorology and Land-Based Observations (Fasal – MNCFC) Operation Forecast

Under the project, field verification and data collection for cotton, paddy, wheat and mustard crops for pre-harvest crop area and production estimation were done for MNCFC, New Delhi. The work of providing smart sampling data for paddy and wheat crops for crop harvesting for the crop project is completed. The data obtained from the assessment is sent to various user departments. The main objective of this project, sponsored by the Government of India, is to estimate crop area and production before harvesting.

AGRI GIS Project

Under the Agriculture and Soil Division, the work of the said project is being done in association with the National Remote Sensing Centre, Hyderabad. This project is sponsored by the Agriculture Department, Government of Madhya Pradesh. Under the project, area and yield estimation are being done for selected districts of soybean, paddy and maize and urad in Kharif and for wheat, mustard and gram crops in Rabi. Before harvesting, work was done to collect field verification data for Kharif crops for estimation of crop area and production. The work of analysis of digital images of microwave satellites has been done for Kharif 2019-20 and 2021-22 and is being done for 2022-23.

14.5.5 STI for Urban development

Automated Layout Process Approval and Scrutiny System (ALPASS)

In 107 cities of the state, including Bhopal, Indore, and Gwalior, GIS-based development permission has started being issued for any kind of development work, including colony construction, marriage garden, petrol pump, warehouse etc.

MPSSDI-MPSEDC has launched Automated Layout Process Approval & Scrutiny System (ALPASS) along with Town and Country Planning (T&CP). In this system, on the land where development permission is required, the architect will have to make a layout map by taking the GIS location and upload it online for approval. The software automatically submits the scrutiny report after checking all the rules, including the master plan.

Apart from this, all the process afterwards is done online instead of through file or note sheet process. A mobile app has also been developed for departmental officers for the purpose of site surveys, with the help of which the survey report is prepared by visiting the site itself. This mobile app is linked to ALPASS software, and the permission letter and final layout are issued online only.

Madhya Pradesh has become the first state in the country to grant permission for this type of GIS-based map. With the introduction of this system, the process has become more transparent. File movement has become faster, and the 60-day time taken for development permissions has been reduced significantly. For the convenience of higher officials, a dashboard and report module has been prepared so that every update of the file can be seen immediately.

This software has also been linked to the master plan being prepared under the AMRUT scheme, land records (Revenue Department), ABPAS-building permission and IGRS-property registration guideline (Sampada-2).

Figure 14.8 : Screenshot of ALPASS

Source: Madhya Pradesh State Electronics Development Corporation

Master Plan Project and AMRUT Project of Madhya Pradesh Cities

The Ministry of Urban Development and Housing, Government of India is preparing GIS based master plans for 34 cities under the AMRUT (1) scheme. Under the project, development plans of cities are being prepared by subject-wise mapping and analysis of social and economic data on the

basis of high magnification satellite images to prepare master plans on a scale of 1:4000. So far, development plans of 31 cities have been prepared.

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